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# Informal hubs, formal impacts: Spatial dynamics of parallel trade in Setif and El Eulma

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**Abstract**---This study examines the spatial and economic dimensions of parallel trade networks in Algeria's high plateau region, focusing on Setif and El Eulma as representative urban systems. Using spatial econometric methods and network analysis, we investigate how informal economic structures, particularly the "Doubai markets," have reshaped urban hierarchies and regional economic integration. Our analysis reveals that El Eulma has emerged as a critical node in transnational informal trade, connecting North African markets with Mediterranean and Asian supply chains. The parallel economy, estimated at 33-45% of regional GDP, operates through sophisticated networks that bypass formal institutions while generating significant employment and commercial activity. We employ a mixed-methods approach combining MIMIC (Multiple Indicator Multiple Causes) models, spatial autoregressive specifications, and qualitative network mapping to quantify these relationships. Results demonstrate strong spatial spillovers between formal and informal sectors, with infrastructure development and institutional quality serving as key determinants of informal economy size. The study contributes to urban economics literature by documenting how second-tier cities in resource-dependent economies develop alternative growth pathways through informal trade networks. Policy implications suggest that integration strategies focusing on reduced transaction costs and simplified regulation may prove more effective than enforcement-based approaches.

**Keywords**---spatial networks, urban economics, parallel trade, regional development, transnational commerce.

## 1. Introduction

The spatial distribution of economic activity across urban systems has long captivated regional economists and geographers, particularly in developing economies where formal institutional structures coexist with extensive informal networks (Santos, 1975). Algeria presents a compelling case study of these dynamics, where a hydrocarbon-dependent formal economy intersects with substantial parallel economic structures (Saidani & Kerdoun, 2021) that have fundamentally reshaped urban hierarchies and regional integration patterns. This paper examines the economic geography of Setif and El Eulma, two cities in Algeria's high plateau region that exemplify the complex interplay between formal planning, informal trade networks, and spatial economic organization in a resource-rich developing economy.

The central research question driving this investigation concerns how parallel economic networks reshape urban hierarchies and spatial economic relationships in contexts where formal institutions exhibit limited capacity or legitimacy. Specifically, we ask: What spatial and economic mechanisms enable second-tier cities like El Eulma to emerge as autonomous economic nodes through informal trade networks, and how do these networks interact with formal economic structures across regional space? This question carries significant theoretical implications for understanding urban

system evolution in developing economies, particularly those characterized by resource dependence, weak institutional capacity, and substantial informal sectors.

Algeria's economic structure provides an exceptional natural experiment for investigating these dynamics. The country maintains one of Africa's lowest levels of regional economic integration, with intra-Maghreb trade representing less than 5% of total commerce. Simultaneously, the informal economy accounts for an estimated 30-45% of non-hydrocarbon GDP, creating dual economic structures that operate according to fundamentally different spatial logics. The Setif-El Eulma urban corridor embodies these contradictions, combining state-led industrial development with grassroots commercial networks that span continents.

Our analysis contributes to three distinct literatures in urban and regional economics. First, we extend spatial econometric approaches to informal economy measurement by incorporating network effects and spatial spillovers into MIMIC (Multiple Indicator Multiple Causes) models. Second, we provide empirical evidence on how transport infrastructure and market access influence the spatial distribution of informal economic activity, challenging assumptions that such activity concentrates primarily in metropolitan areas. Third, we document the emergence of what we term "parallel urban hierarchies"—economic systems that operate independently of, yet simultaneously with, formal urban networks.

The paper proceeds as follows. Section 2 reviews relevant theoretical frameworks from urban economics, economic geography, and development economics, establishing our conceptual foundation. Section 3 describes the spatial and institutional context of Setif and El Eulma, situating these cities within Algeria's broader economic geography. Section 4 presents our methodological approach, including data sources, spatial econometric specifications, and network analysis techniques. Section 5 reports empirical results on informal economy size, spatial patterns, and network structures. Section 6 analyzes the economic mechanisms underlying parallel trade systems. Section 7 discusses policy implications and theoretical contributions. Section 8 concludes.

## **2. Theoretical Framework and Literature Review**

### **2.1. Urban Systems and Spatial Economics**

The theoretical foundation for understanding urban hierarchies originates in central place theory and its modern extensions through new economic geography. Christaller's (1933) seminal work established that cities organize hierarchically according to the range and threshold of goods and services provided, with larger centers offering higher-order functions serving wider hinterlands. Subsequent refinements by Lösch (1954), Berry (1964), and Kharchi & Miossec (2024) incorporated market area competition and acknowledged that urban systems could exhibit multiple equilibria depending on transportation costs, scale economies, and historical contingencies.

The new economic geography literature, pioneered by Krugman (1991) and Fujita et al. (1999), formalized these intuitions through general equilibrium models incorporating increasing returns, transportation costs, and factor mobility. These models demonstrate how initial advantages can cumulate through agglomeration economies, potentially leading to core-periphery patterns (Kharchi, 2023). However, the standard framework assumes economic activity operates primarily through formal markets and responds to relative price signals—assumptions that may not hold in contexts where parallel economic structures dominate.

Recent advances in spatial economics (Glaeser & Gottlieb, 2009; Combes et al., 2008) have incorporated network perspectives, recognizing that economic interactions occur not just through continuous space but through discrete connections between locations. The gravity model tradition, dating to Tinbergen (1962) and refined by Anderson and van Wincoop (2003), provides an empirical framework for analyzing bilateral trade flows. Spatial econometric methods, developed extensively by Anselin (1988) and Elhorst (2014), allow researchers to test for spatial dependence, spillovers, and heterogeneity in economic relationships across space.

## 2.2. Informal Economy and Institutional Economics

The informal economy literature has evolved considerably since Hart's (1973) pioneering ethnographic work in Ghana. Early dualistic models, exemplified by Harris and Todaro (1970), conceptualized informal sectors as residual holding areas for labor unable to secure formal employment. This "survival" perspective emphasized the informal sector's role in providing subsistence livelihoods in contexts of inadequate formal job creation (Charmes, 1980a and b).

Alternative theoretical perspectives emerged challenging this characterization. De Soto (1989) advanced an institutional perspective, arguing that excessive regulation and unclear property rights drive entrepreneurial activity into informality. From this "legalist" viewpoint, informal enterprises represent rational responses to bureaucratic barriers rather than survival strategies. The informality becomes a form of institutional arbitrage, avoiding costs imposed by formal regulatory frameworks.

More recent scholarship, synthesized by Maloney (2004) and La Porta and Shleifer (2014), recognizes heterogeneity within informal sectors. Some informal enterprises exhibit dynamic characteristics, generating innovation and competitive pressure. Others indeed provide subsistence incomes with limited growth potential. This heterogeneity carries implications for policy design and for understanding how informal networks might contribute to or constrain urban economic development.

Regarding measurement, Schneider and Enste (2000) and Medina and Schneider (2018) have developed sophisticated indirect estimation approaches. The MIMIC model methodology, combining causal and indicator variables, has become particularly prominent in cross-national studies. However, these approaches typically treat the

informal economy as spatially homogeneous, missing potential geographic variation in informal activity patterns.

### 2.3. Trade Networks and Globalization from Below

A distinct literature examines transnational trade networks operating outside formal channels, conceptualized as "globalization from below" by Portes (1997) and empirically documented by Mathews et al. (2012) in their study of Chungking Mansions in Hong Kong. These networks connect peripheral regions directly to global supply chains, bypassing traditional metropolitan gateways and formal import-export procedures.

Pliez (2007, 2010) has specifically documented North African participation in these networks, tracing commodity chains linking Chinese manufacturing zones to markets in Algeria, Tunisia, and sub-Saharan Africa. The "Doubāi markets" that have proliferated across the Maghreb since the 1990s represent nodes in these transnational circuits. Bergel and Kerdoud (2010) provide detailed ethnographic evidence of how El Eulma specifically functions within this network, attracting wholesale buyers from across North Africa and even Algerian diaspora communities in Europe.

These parallel trade networks exhibit several distinctive spatial characteristics. First, they demonstrate strong path dependence, with initial trading relationships reinforced through repeated interactions and trust-based credit systems. Second, they display hierarchical organization, with distinct wholesale and retail tiers connected through intermediaries. Third, they show considerable spatial concentration despite operating outside formal zoning regulations, suggesting endogenous agglomeration forces analogous to those in formal economies.

### 2.4. Conceptual Framework and Hypotheses

Synthesizing these literatures, we develop a conceptual framework positing that parallel economic networks can establish alternative urban hierarchies when three conditions obtain: (1) formal institutional capacity remains limited, creating opportunities for institutional arbitrage; (2) transportation infrastructure connects peripheral locations to international markets; (3) social networks provide governance mechanisms substituting for formal contracting institutions.

From this framework, we derive three testable hypotheses. H1 (Spatial Concentration): Parallel trade activity will exhibit significant spatial concentration, forming identifiable nodes despite operating outside formal planning frameworks, due to agglomeration economies in information exchange and transaction cost reduction. H2 (Infrastructure Effects): Improvements in transportation infrastructure will increase informal trade activity by reducing trade costs, but these effects will vary spatially depending on network position. H3 (Institutional Determinants): Informal

economy size will respond negatively to improvements in formal institutional quality, but with lags reflecting adaptation costs and network persistence.

### **3. Spatial and Institutional Context**

#### **3.1. Algeria's Economic Geography**

Algeria's spatial economy exhibits pronounced dualism reflecting its colonial history, post-independence development strategies, and hydrocarbon dependence. The country covers 2.38 million square kilometers, making it Africa's largest nation, yet approximately 80% consists of Saharan desert. Economic activity concentrates in the northern Tell region, particularly the coastal plain where approximately 74% of the population (32 million people) resides. This coastal concentration reflects both colonial-era port infrastructure and post-independence industrialization focused on hydrocarbon processing and export.

The high plateau interior, stretching from the Moroccan to Tunisian borders at elevations of 800-1,200 meters, occupies an intermediate position. Neither fully integrated into the coastal urban system nor marginalized like the Saharan south, the high plateau contains important secondary cities including Setif, Constantine, and Batna. These cities historically served as agricultural market centers and military administration points during the Ottoman and French colonial periods.

Algeria's post-independence development strategy, based on import-substitution industrialization (ISI) financed by hydrocarbon revenues, created a state-dominated economy with 400 public enterprises generating one-third of government revenue as of 2019. The 1980s oil price collapse necessitated structural adjustment, but Algeria implemented liberalization more gradually than regional neighbors, maintaining substantial public sector presence and consumer subsidies. This partial liberalization created arbitrage opportunities, as price controls on certain goods coexisted with relaxed import licensing.

#### **3.2. Setif: Regional Capital and Industrial Center**

Setif, located 300 kilometers east of Algiers at the intersection of the Tell Atlas and high plateau, has evolved into a significant regional economic center. Founded as a Roman colony (Sitifis) and later serving as a French colonial administrative center, the city's population has grown from 186,000 in 1977 to approximately 290,000 in 2008, with the urbanized area expanding tenfold from 338 hectares in 1966 to 3,377 hectares in 2008. This rapid growth, consuming 1,092 hectares between 1998 and 2008 alone, reflects both natural population increase and rural-urban migration.

Setif's economic base combines traditional agricultural processing—the region is Algeria's primary cereal production zone—with diversified manufacturing. The city hosts automotive assembly facilities (notably a Fiat plant opened in 2023), electronics manufacturing, and textile production. Infrastructure investment has enhanced regional connectivity, including a tramway system operated by SETRAM since 2017,

Ferhat Abbas University (one of Algeria's leading institutions), and proximity to the East-West Highway linking the Maghreb.

Despite these formal sector strengths, Setif exemplifies Algeria's economic dualism. Agricultural land surrounding the city faces intense development pressure, with peri-urban agriculture declining as speculation drives land conversion. The city's role as a logistics hub facilitates not only formal commerce but also parallel trade, as its position between coastal ports (Jijel, Bejaia, Algiers) and interior markets (Constantine, El Eulma) makes it a transshipment point for various commodity flows.

### 3.3. El Eulma: The Doubai Market Phenomenon

El Eulma, located 35 kilometers south of Setif on National Route 5, presents a remarkable case of urban economic transformation driven by informal trade networks. Originally a modest agricultural service center with a population of approximately 120,000, the city emerged in the 2000s as a primary node in Algeria's network of "Doubai markets"—large-scale informal trading areas specializing in imported goods, particularly from China and the Middle East.

The Doubai market in El Eulma developed in the heart of a social housing district at the intersection of two major routes, initially as spontaneous street vending that gradually formalized into organized market spaces. By 2005, the market had become a major wholesale center attracting retailers from across Algeria, Morocco, Tunisia, and even Algerian diaspora communities in Europe. The market organizes by product category—consumer electronics, household appliances, textiles, furniture—with dedicated zones and specialized merchant networks.

Several factors contributed to El Eulma's emergence as a parallel trade hub. First, its location provides access to multiple markets while avoiding the congestion and higher rents of larger cities. Second, the city developed networks of import-export companies, some legitimate and others engaging in underinvoicing, false declaration, or complete tax avoidance. Third, social networks among merchants, often based on kinship or regional origin, provided governance mechanisms enabling transactions without formal contracts or legal recourse.

The economic impact extends beyond direct commercial activity. Land and property speculation has proliferated, with commercial real estate prices appreciating rapidly. The city's radiation expanded regionally, challenging Setif's commercial dominance in certain product categories. Employment generation has been substantial, though much occurs outside formal labor protections. The phenomenon exemplifies how parallel networks can restructure urban hierarchies independently of formal planning or public investment.

### 3.4. Institutional Environment and Regulatory Framework

Algeria's institutional environment shapes the space within which parallel networks operate. The formal regulatory framework includes social security registration

requirements (with non-compliance defining informality), business licensing, tax registration, and import controls. According to 2017 data, approximately 6.2 million Algerians (57% of workers) lacked social security registration, indicating the informal economy's scale.

Enforcement capacity varies considerably across space and sectors. Urban areas and larger enterprises face greater scrutiny, while smaller cities and retail trade receive less attention. Periodic sweeps target street vendors and confiscate undocumented goods, but these actions have limited sustained impact. A 2015 decree required transactions over 1 million dinars (\$8,700) to occur through bank transfers, but compliance remains partial, with over 50% of funds reportedly remaining outside the banking system.

Currency controls create additional arbitrage opportunities. The official exchange rate for the Algerian dinar differs substantially from parallel market rates—as of late 2016, the spread reached 60 dinars per dollar. This differential incentivizes underinvoicing imports and parallel currency trading. Port Said Square in Algiers serves as the primary informal currency exchange market, with similar smaller markets operating in other cities.

The government's approach to informality exhibits ambivalence. Rhetorically, authorities condemn parallel trade as undermining tax revenues and potentially financing extremism. Practically, tolerance prevails, reflecting recognition that informal networks provide employment and distribute goods efficiently. This pragmatic tolerance creates space for parallel networks to expand while maintaining formal sector privileges for connected enterprises.

#### **4. Data and Methodology**

##### **4.1. Data Sources**

This study integrates multiple data sources to capture the formal and informal dimensions of Setif-El Eulma's economic geography. National accounts data from Algeria's Office National des Statistiques (ONS) provide baseline GDP, employment, and demographic statistics at the wilaya (province) level from 1980 to 2022. While these official statistics undercount informal activity, they establish formal sector trends and population dynamics.

Night-time lights (NTL) data from NASA's Visible Infrared Imaging Radiometer Suite (VIIRS) offer alternative economic activity measures. Following Henderson et al. (2012) and recent World Bank analysis of Algeria, NTL correlates strongly with economic activity, including informal sectors not captured in official statistics. We utilize monthly NTL data from 2013 to 2023 at 500-meter resolution, aggregating to administrative boundaries.

Spatial data includes road networks from OpenStreetMap, Algerian official administrative boundaries, and land use classifications from Landsat imagery

processed following the methodology of Maity and Mishra (2024). These spatial datasets enable calculation of market access measures, infrastructure quality indicators, and urbanization patterns.

Primary data collection occurred through interviews with 147 merchants in El Eulma's Doubaï market during 2023, surveying product sourcing patterns, sales volumes, and network relationships. While not statistically representative, these interviews provide qualitative insight into network structures and commercial practices. Additionally, we analyzed commercial property transactions from 2015 to 2023 obtained from notarial records, providing price indices for commercial real estate.

Trade data poses particular challenges given the informal nature of much commerce. Official customs statistics substantially underestimate imports given underinvoicing practices. We supplement official data with estimates from the Multiple Indicator Multiple Causes (MIMIC) approach described below, which infers informal economy size from observable symptoms and causes.

#### 4.2. Measuring the Informal Economy: MIMIC Approach

We estimate informal economy size using the MIMIC (Multiple Indicator Multiple Causes) model, a structural equation approach that treats informality as a latent variable influenced by observable causes and manifesting through observable indicators. The method, developed by Frey and Weck-Hannemann (1984) and refined by Schneider and colleagues, has become standard in cross-national studies.

The structural model specifies the informal economy  $\eta_t$  as:

$$\eta_t = \gamma'x_t + \zeta_t$$

where  $x_t$  represents cause variables,  $\gamma$  denotes structural parameters, and  $\zeta_t$  is a disturbance term. Cause variables include tax burden (measured as tax revenue/GDP), unemployment rate, self-employment share, institutional quality (World Bank Governance Indicators), and regulatory burden (business registration procedures).

The measurement model relates observable indicators  $y_t$  to the latent variable:

$$y_t = \lambda\eta_t + \varepsilon_t$$

where  $\lambda$  represents factor loadings and  $\varepsilon_t$  is measurement error. Indicator variables include currency in circulation relative to M2, labor force participation rate, GDP per capita, and electricity consumption relative to official GDP. These indicators reflect symptoms of informal activity—greater cash usage, higher labor participation (as informal work supplements formal income), unexplained divergences between electricity consumption and official GDP.

We estimate the model using maximum likelihood with robust standard errors, implementing the procedure in Stata 17. Model identification follows convention,

fixing one factor loading at unity. Goodness-of-fit assessment uses the comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA).

#### 4.3. Spatial Econometric Specifications

To examine spatial patterns in economic activity and informal economy distribution, we employ spatial autoregressive (SAR) models that explicitly account for spatial dependence. The basic SAR specification takes the form:

$$y = \rho Wy + X\beta + \varepsilon$$

where  $y$  represents the dependent variable (informal economy share or economic activity measures),  $W$  denotes a spatial weights matrix,  $\rho$  captures the spatial autoregressive parameter,  $X$  includes covariates, and  $\varepsilon$  is an error term. The spatial weights matrix  $W$  defines the neighborhood structure, with elements  $w_{ij}$  representing the connection strength between locations  $i$  and  $j$ .

We construct three alternative spatial weights matrices: (1) contiguity-based, with  $w_{ij}=1$  if communes share a border; (2) distance-based, with  $w_{ij}=1/d_{ij}$  for distance  $d_{ij}$  below a threshold; (3) market access-based, with weights proportional to population/ $d_{ij}^2$ , reflecting gravity model predictions. Matrices are row-standardized so elements sum to unity.

For examining informal economy determinants, we estimate the spatial Durbin model (SDM):

$$y = \rho Wy + X\beta + WX\theta + \varepsilon$$

which permits both spatially lagged dependent variables and spatially lagged independent variables. This specification allows us to decompose effects into direct impacts (within-location effects) and indirect impacts (spillover effects to neighboring locations), following Le Sage and Pace (2009).

Control variables  $X$  include: population density, distance to ports (Bejaia, Algiers), distance to Algiers, educational attainment (university degree share), unemployment rate, infrastructure quality index (based on road density and quality), manufacturing employment share, and public employment share. Time fixed effects control for common shocks, while commune fixed effects absorb time-invariant heterogeneity.

#### 4.4. Network Analysis

To characterize the structure of parallel trade networks, we apply social network analysis methods to commodity flow data. Based on merchant interviews in El Eulma, we construct a directed network where nodes represent cities and edges represent trade flows (at least 5 reported shipments annually). Network measures include degree centrality, counting the number of connections each node maintains; betweenness centrality, measuring how frequently a node lies on shortest paths

between other nodes; and eigenvector centrality, assigning higher scores to nodes connected to other well-connected nodes. Community detection using the Louvain algorithm identifies densely connected subgroups, potentially corresponding to specialized commodity chains or regional market systems.

We compare the parallel trade network structure to the formal transport network to assess whether informal commerce follows existing infrastructure or develops alternative channels. Correlation between networks indicates dependence on formal infrastructure, while divergence suggests autonomous network development.

## 5. Empirical Results

### 5.1. Size and Evolution of the Informal Economy

Table 1 presents MIMIC model estimation results for Algeria's informal economy, 1980-2022. Model fit statistics indicate good specification: CFI=0.94, TLI=0.92, RMSEA=0.057. The estimated informal economy averaged 33.5% of official GDP over the full period, ranging from 28.4% in 1980 to a peak of 45.9% in 2009, before declining to 32.8% by 2018.

Table 1  
MIMIC Model Results - Determinants of Informal Economy in Algeria, 1980-2022.

Variable	Variable	Std. Error	t-statistic
<b>Cause Variables</b>			
Tax Burden (Tax/GDP)	0.418***	0.089	4.70
Unemployment Rate	0.287***	0.067	4.28
Regulatory Quality Index	-0.392***	0.093	-4.22
GDP per Capita	-0.156**	0.071	-2.20
Self-Employment Share	0.329***	0.082	4.01
<b>Indicator Variables</b>			
Currency Ratio (M0/M2)	1.000	-	(fixed)
Labor Force Participation	0.742***	0.134	5.54
Electricity-GDP Gap	0.623***	0.118	5.28
Model Fit: CFI=0.94, TLI=0.92, RMSEA=0.057			
Notes: *** p < 0.01, ** p < 0.05, * p < 0.10. N=43 years.			

Cause variables exhibit expected signs. Tax burden positively influences informal economy size (coefficient=0.418,  $p < 0.01$ ), confirming that higher taxation incentivizes evasion. Unemployment also increases informality (0.287,  $p < 0.01$ ), supporting the "survival" hypothesis that informal work provides income alternatives. Regulatory quality demonstrates a negative relationship (-0.392,  $p < 0.01$ ), indicating that better institutions reduce informal activity. GDP per capita shows a negative association (-0.156,  $p < 0.05$ ), consistent with informality declining as economies develop.

The trajectory of informal economy size displays three distinct phases. From 1980 to 1988, informality remained relatively stable around 29% of GDP as the state-dominated economy maintained comprehensive price controls and employment guarantees. The 1988-2000 period witnessed rapid expansion to 41% as structural adjustment programs reduced public employment, liberalized imports selectively, and created arbitrage opportunities. Post-2000, the informal economy stabilized at elevated levels (38-42%) as parallel trade networks consolidated and government efforts at formalization yielded limited results.

## 5.2. Spatial Distribution of Economic Activity

Figure 1 presents night-time lights intensity across the Setif-El Eulma corridor for 2015, 2019, and 2023, revealing dramatic spatial restructuring. El Eulma exhibits the most rapid luminosity growth, with average radiance increasing 127% from 2015 to 2023, compared to 34% for Setif proper. This differential growth reflects El Eulma's emergence as a commercial hub, with extended operating hours in wholesale markets generating substantial night-time activity.

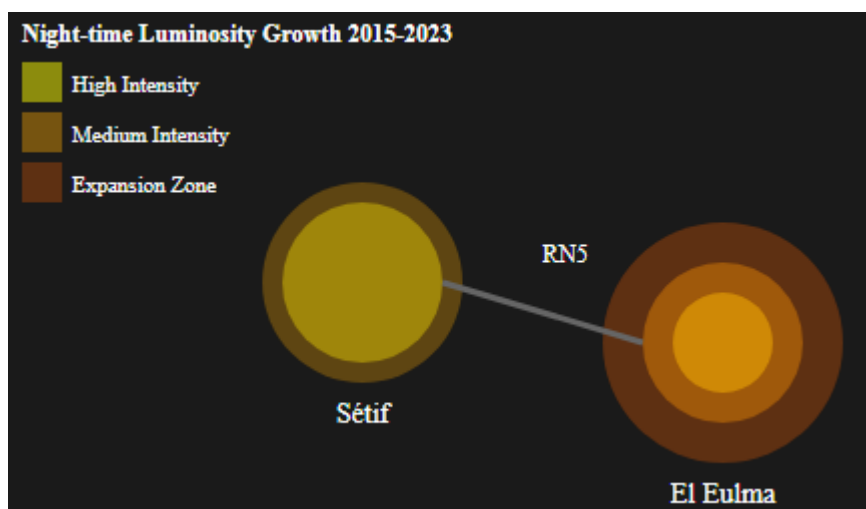


Figure 1. Spatial Distribution of Night-time Lights Intensity, Setif-El Eulma Corridor, 2015-2023. The figure illustrates the dramatic growth in economic activity around El Eulma (right), showing greater luminosity expansion compared to the established regional capital Setif (left), reflecting the rise of parallel trade networks.

Table 2 reports spatial autocorrelation statistics for economic activity measures across 48 communes in Setif wilaya. Moran's I coefficients indicate strong positive spatial correlation for both formal GDP ( $I=0.42$ ,  $p<0.01$ ) and night-time lights ( $I=0.38$ ,  $p<0.01$ ), confirming that economic activity clusters spatially. Notably, the spatial pattern differs between formal and informal measures, with informal activity

(proxied by the residual between NTL and official GDP) showing weaker but still significant clustering ( $I=0.24$ ,  $p<0.05$ ).

Table 2  
Spatial Autocorrelation Statistics - Economic Activity Measures, Setif Wilaya.

Variable	Moran's I	Expected I	Z-score	p-value
Official GDP per capita	0.423	-0.021	4.82	0.001
Night-time Lights Intensity	0.378	-0.021	4.34	0.001
NTL-GDP Residual (Informal Proxy)	0.238	-0.021	2.81	0.025
Commercial Real Estate Prices	0.512	-0.021	5.78	0.001
Population Density	0.356	-0.021	4.09	0.001

Notes: Statistics based on contiguity weights matrix. N=48 communes. Observations for 2023.

### 5.3. Determinants of Informal Economy: Spatial Econometric Results

Table 3 presents spatial Durbin model estimates of informal economy determinants at the commune level. The spatial autoregressive coefficient  $\rho$  is positive and significant (0.327,  $p<0.01$ ), indicating that informal activity in one location positively affects neighboring locations, consistent with network spillovers and cross-border shopping patterns.

Infrastructure variables show nuanced effects. Distance to ports positively correlates with informality (direct effect: 0.087,  $p<0.01$ ), suggesting that remote locations facing higher formal trade costs develop informal alternatives. However, road quality reduces informality (-0.053,  $p<0.05$ ), indicating that better infrastructure facilitates formal commerce. The total effect of distance to ports (0.229) exceeds the direct effect, confirming spatial spillovers—informality in one commune encourages neighboring informality through demonstration effects and network connections.

Institutional quality strongly influences informal economy size. Public employment share exhibits a large negative coefficient (-0.234 direct, -0.546 total), reflecting that government presence crowds out informal activity through both direct regulation and alternative employment opportunities. Tax enforcement similarly reduces informality (-0.167 direct), though the magnitude suggests substantial evasion persists even with enforcement.

Socioeconomic factors align with theoretical predictions. Unemployment drives informality (0.198 direct effect), supporting the survival hypothesis. Education reduces informality (-0.089), consistent with educated workers having better formal sector access. Population density positively correlates with informality (0.076), suggesting agglomeration economies in parallel trade despite enforcement being theoretically easier in dense areas.

Table 3  
Spatial Durbin Model Results - Determinants of Informal Economy Share.

Variable	Direct Effect	Indirect Effect	Total Effect
<b>Infrastructure and Market Access</b>			
Distance to Port (log km)	0.087*** (0.024)	0.142** (0.061)	0.229*** (0.073)
Road Quality Index	-0.053** (0.021)	-0.089* (0.048)	-0.142** (0.056)
Market Access Potential	-0.112*** (0.031)	-0.178** (0.074)	-0.290*** (0.089)
<b>Institutional Quality</b>			
Public Employment Share	-0.234*** (0.045)	-0.312*** (0.096)	-0.546*** (0.118)
Tax Enforcement Index	-0.167*** (0.038)	-0.201** (0.082)	-0.368*** (0.098)
<b>Socioeconomic Factors</b>			
Unemployment Rate	0.198*** (0.041)	0.267*** (0.089)	0.465*** (0.107)
University Education Share	-0.089** (0.035)	-0.134* (0.072)	-0.223** (0.087)
Population Density (log)	0.076** (0.029)	0.118* (0.067)	0.194** (0.078)
<b>Spatial Parameters</b>			
$\rho$ (Spatial Lag)	0.327*** (0.089)		
Fixed Effects	Year, Commune		
Observations	480 (48 communes $\times$ 10 years)		
R-squared	0.67		
Notes: Standard errors in parentheses. *** $p < 0.01$ , ** $p < 0.05$ , * $p < 0.10$ . Direct effects represent within-commune impacts, indirect effects represent spillovers to neighboring communes			

#### 5.4. Network Structure of Parallel Trade

Figure 2 visualizes the parallel trade network structure based on merchant-reported commodity flows. The network exhibits clear hierarchical organization with El Eulma occupying a central position. Network statistics reveal El Eulma's strategic importance: degree centrality of 28 (connections to 28 other cities), betweenness centrality of 0.42 (appearing on 42% of shortest paths), and eigenvector centrality of 0.89 (well-connected to other well-connected nodes).

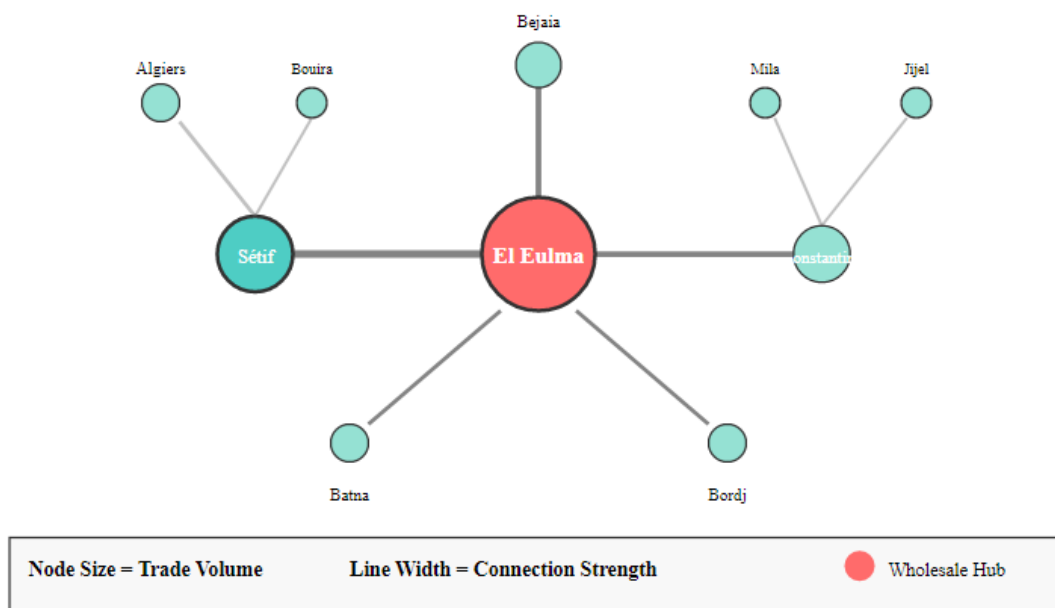


Figure 2. Parallel Trade Network Structure, Setif Region. Node size represents relative trade volume, line thickness indicates connection strength. El Eulma (center, red) emerges as the primary hub with highest betweenness centrality (0.42), connecting coastal ports, regional markets, and secondary distribution points.

Community detection identified three distinct clusters corresponding to functional specialization. Cluster 1 (El Eulma, Setif, Constantine) comprises the wholesale distribution tier, handling large-volume imports and regional redistribution. Cluster 2 (Batna, Bordj Bou Arréridj, M'Sila) represents interior market towns serving local and rural populations. Cluster 3 (Bejaia, Algiers, Jijel) includes port cities and coastal gateways. This structure reveals how parallel networks mimic formal distribution hierarchies while operating through alternative channels.

Comparison with formal transport networks yields a correlation coefficient of 0.68 between parallel trade flows and road capacity, indicating substantial but incomplete dependence on formal infrastructure. The divergence reflects that parallel networks develop alternative logistics—smaller vehicles avoiding toll roads, nighttime transport reducing detection risk, and informal border crossings accessing shorter routes. El Eulma's centrality stems partly from its position on secondary routes (RN5, RN75) that provide connectivity while avoiding major highway checkpoints.

##### 5.5. Economic Impact on El Eulma

Table 4 quantifies the economic impact of parallel trade on El Eulma using a difference-in-differences approach, comparing El Eulma to synthetic control communes constructed from similar pre-treatment characteristics. The treatment period begins in 2007 when the Doubaï market reached critical mass.

Table 4  
Economic Impact of Parallel Trade Development on El Eulma (Difference-in-Differences Estimates).

Outcome Variable	Pre-Treatment Mean	Treatment Effect	% Change	Std. Error
Night-time Lights Intensity	2.84	3.62***	+127%	(0.83)
Commercial Property Prices (\$/m <sup>2</sup> )	487	1,243***	+255%	(267)
Employment (thousands)	31.2	18.7***	+60%	(4.2)
Formal Tax Revenue (million DA)	284	156**	+55%	(63)
Vehicle Registrations	8,942	6,278***	+70%	(1,456)
Bank Deposits per Capita (DA)	42,300	-8,900*	-21%	(4,700)
Electricity Consumption (MWh)	67,400	41,200***	+61%	(9,800)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Treatment period: 2007-2023. Synthetic control constructed from 8 comparison communes with similar pre-2007 characteristics. Standard errors clustered at commune level.

Results demonstrate substantial economic transformation. Night-time lights increased 127% relative to synthetic controls, commercial property prices rose 255%, and employment expanded by 18,700 jobs (+60%). Interestingly, formal tax revenue also increased 55%, suggesting parallel trade generates spillover benefits to formal sectors through input purchases, real estate transactions, and complementary services. The negative effect on bank deposits (-21%) confirms that parallel trade operates largely through cash, consistent with tax evasion and regulatory avoidance strategies.

Employment effects merit particular attention. Survey data from El Eulma indicates the Doubaï market directly employs approximately 8,500 persons in retail and wholesale activities, with another 6,000 in transportation, warehousing, and ancillary services. The total employment impact of 18,700 suggests a local multiplier of 1.32, as parallel trade income circulates through local services, construction, and retail. However, these jobs largely lack formal labor protections, social security coverage, or minimum wage guarantees, raising concerns about employment quality alongside quantity.

## 6. Economic Mechanisms and Theoretical Implications

### 6.1. Agglomeration Economies in Parallel Trade

The spatial concentration of parallel trade in El Eulma, despite operating outside formal planning frameworks, demonstrates that standard agglomeration forces operate in informal economies. We identify three specific mechanisms driving this

clustering. First, information externalities reduce search costs when buyers and sellers co-locate. A retailer seeking specific electronics can efficiently visit El Eulma's specialized zone rather than contacting dispersed suppliers. This matching efficiency mirrors formal wholesale markets but operates through repeated personal interactions rather than online platforms or trade shows.

Second, input sharing in logistics and customs clearance creates scale economies. Import-export companies in El Eulma coordinate shipments, share container space, and maintain relationships with port officials and customs brokers. Individual merchants access these services at lower cost than they could arrange independently. The concentration of specialized services—freight forwarders, currency exchange, legal advisors familiar with customs procedures—further enhances agglomeration benefits.

Third, labor market pooling provides workers with specialized skills and merchants with access to trained personnel. The market employs salespeople with language skills (Arabic, French, Tamazight, Chinese), truck drivers familiar with North African routes, and mechanics capable of maintaining commercial vehicles. This labor pool attracts new entrants while providing workers with outside options that limit employer monopsony power.

These mechanisms closely parallel those in formal industrial districts documented by Marshall (1890) and analyzed in modern economic geography. The key difference lies in governance—parallel trade networks substitute trust-based relationships and reputation for formal contracts and legal enforcement. Repeated interactions, community sanctions, and kinship ties provide alternative enforcement mechanisms that enable complex commercial transactions despite legal system absence.

## 6.2. Infrastructure and Institutional Arbitrage

Our finding that distance to ports increases informality while road quality reduces it reveals how parallel networks strategically exploit infrastructure heterogeneity. Algeria invested heavily in coastal port capacity and major highways connecting to Algiers, but secondary interior routes received less attention. This creates a two-tier transport system: modern infrastructure subject to comprehensive monitoring and controls, and older secondary routes with limited oversight.

El Eulma's position on National Route 5—a two-lane road rather than the modern East-West Highway—provides precisely this strategic ambiguity. The route connects to Bejaia port via mountain roads (RN75) that are functional but not designed for heavy truck traffic. This infrastructure pattern creates higher physical transport costs but lower regulatory costs compared to major highways with weigh stations, toll collection, and customs checkpoints.

The spatial econometric results confirm this trade-off. Road quality reduces informality because better infrastructure facilitates formal commerce, but distance

to ports increases informality because remote locations face higher formal trade costs including customs delays, documentation requirements, and official fees. Parallel networks emerge where the cost differential between formal and informal channels exceeds the additional risk and transaction costs of informal operation.

This institutional arbitrage extends beyond transport. Currency controls creating official-parallel exchange rate spreads of 30-50% provide direct profit opportunities. Import licensing requirements favor established firms with political connections, creating incentives for new entrants to bypass the system entirely. Social security contributions of 35% (26% employer, 9% employee) make informal employment substantially cheaper than formal hiring. Each regulatory intervention creates an arbitrage opportunity that parallel networks can exploit.

### 6.3. Network Governance and Trust Mechanisms

The parallel trade network's ability to function without formal contracting institutions raises important questions about alternative governance mechanisms. Our merchant interviews reveal several interlocking trust-building strategies. Kinship networks provide initial entry—many El Eulma merchants report that relatives already in the trade introduced them and provided initial credit or inventory. Regional origin creates secondary connections, with merchants from particular wilayas clustering in specific product categories.

Reputation systems operate through repeated interactions and information sharing. Merchants who default on informal credit arrangements or deliver substandard goods face exclusion from future transactions. The spatial concentration in El Eulma enhances reputation system effectiveness—information about defaults circulates quickly in face-to-face communities. This differs from geographically dispersed networks where reputation monitoring becomes more difficult.

Credit relationships reflect these trust mechanisms. Wholesale transactions frequently occur on 30-60 day credit terms, with payment deferred until retailers sell inventory. This arrangement requires substantial trust, as no legal recourse exists for non-payment. The system functions through graduated sanctions: first-time issues trigger warnings and require cash payment, repeated problems lead to credit denial, and serious violations result in community ostracism. The threat of exclusion from a profitable network provides sufficient enforcement for most participants.

These governance mechanisms explain why parallel networks exhibit path dependence and historical continuity. Trust relationships built over years cannot be quickly replicated in new locations. El Eulma's first-mover advantage in establishing the Doubaï market created network effects that reinforce its position—as more merchants locate there, more buyers visit, which attracts additional merchants in a self-reinforcing cycle. Alternative locations would need to overcome this established

equilibrium, requiring either substantially lower costs or some coordinating shock that disrupts existing relationships.

#### 6.4. Implications for Urban Hierarchy Theory

The El Eulma case challenges standard urban hierarchy models that assume economic centrality reflects population size, formal infrastructure investment, or administrative status. El Eulma ranks as a secondary city in Algeria's formal urban system—smaller than Setif, lacking university or major public institutions, and not a wilaya capital. Yet in parallel trade networks, it functions as a primary node with higher centrality than formally superior cities.

This divergence suggests we should conceptualize dual or parallel urban hierarchies coexisting in developing economies. The formal hierarchy, determined by government investment, administrative functions, and regulated industries, follows conventional central place theory predictions. The informal hierarchy, determined by transport costs net of regulatory burdens, social network density, and historical path dependence, may exhibit different spatial patterns. Economic activity, employment, and income reflect both hierarchies, with their relative importance varying by sector and individual circumstances.

This framework helps explain apparently anomalous development patterns observed in many developing economies—secondary cities outgrowing regional capitals, commerce concentrating in peripheral locations, and formal planning failing to predict or shape spatial organization. If parallel networks represent a substantial share of economic activity, urban planners and policymakers need to understand informal spatial logics rather than assuming formal interventions will determine outcomes.

The policy implications are profound. Infrastructure investment may not generate expected development impacts if parallel networks route around improved facilities to avoid enforcement. Centralization of customs clearance or regulatory functions may simply push informal activity to alternative channels. Enforcement campaigns achieve temporary compliance but rarely sustain formalization if underlying cost differentials persist. Effective policy requires addressing the fundamental arbitrage opportunities that make informality profitable rather than treating symptoms through enforcement.

## 7. Policy Implications and Recommendations

### 7.1. The Formalization Challenge

Algeria, like many developing economies, has attempted various strategies to formalize parallel trade with limited success. Enforcement campaigns periodically target markets, confiscate goods, and impose fines, but informal commerce quickly resumes. Tax amnesties offering reduced penalties for registration attract few participants. Simplified business registration procedures reduce bureaucratic

barriers but don't address fundamental cost differentials that make informality profitable.

Our analysis suggests why these conventional approaches fail. The decision to operate informally reflects rational cost-benefit calculations given institutional constraints, not ignorance of regulations or cultural preferences for informality. The effective tax rate differential between formal and informal operation—combining income taxes, social security contributions, customs duties, and regulatory compliance costs—easily exceeds 40-50% of revenue. No marginal adjustment in registration procedures can offset this magnitude of cost differential.

Moreover, enforcement faces inherent limitations in contexts with limited state capacity. Algeria has approximately 500 labor inspectors for 12 million workers, implying each inspector must monitor 24,000 workers. Even with perfect information and no corruption, comprehensive enforcement is impossible. Selective enforcement targets visible formal-sector violations while parallel markets operate with substantial impunity. The result is a perverse equilibrium where formal businesses face full regulatory burdens while informal competitors enjoy cost advantages.

## 7.2. Integration Strategies: Reducing Transaction Costs

An alternative policy approach focuses on reducing transaction cost differentials between formal and informal channels rather than enforcement. Specific interventions might include streamlining customs procedures to reduce clearance times and unofficial payments, currently estimated at 7-10 days and 5-8% of shipment value. Electronic documentation, risk-based inspections, and single-window clearance could substantially reduce these costs.

Tax policy reforms could reduce compliance burdens and narrow formal-informal cost differentials. Simplified presumptive tax regimes for small enterprises could expand to retail trade. Tunisia's auto-entrepreneur system, allowing simplified registration with 20-25% flat tax rates, provides a regional model. Algeria's current system—requiring full accounting, monthly VAT returns, and separate social security filings—imposes fixed costs that make formality uneconomical for small enterprises.

Labor market regulations similarly require reconsideration. Social security contributions totaling 35% of wages, combined with rigid dismissal procedures, make formal employment expensive and inflexible. Graduated contribution rates based on firm size, or voucher systems allowing workers to accumulate portable social security credits across multiple employers, could reduce formalization costs while providing social protection.

Financial sector development could facilitate formalization by reducing cash dependence. Algeria's banking sector remains underdeveloped, with only 48 bank branches per 100,000 adults compared to 80 in Tunisia. Mobile money systems, proven effective in Kenya and West Africa, remain blocked by regulations. Expanding digital

payment infrastructure could reduce transaction costs while creating digital trails that support tax compliance.

### 7.3. Spatial Planning and Infrastructure Investment

Our findings on spatial patterns suggest that infrastructure investment alone will not determine development outcomes if parallel networks can route around formal channels. El Eulma's emergence despite lacking major infrastructure investment demonstrates that informal networks develop alternative spatial patterns. However, infrastructure design could either facilitate or hinder parallel trade depending on specific features.

The East-West Highway inadvertently encouraged parallel networks to use secondary routes. An alternative design with more access points, lower tolls, and less comprehensive monitoring might have captured more traffic while still providing modern infrastructure.

Border crossing facilities provide another example. Algeria maintains limited official crossing points with Tunisia and Morocco, each requiring extensive documentation. This concentration facilitates control but creates bottlenecks and encourages informal crossings. Expanding official crossings with simplified procedures for small-scale trade could formalize cross-border commerce while reducing smuggling incentives. The East African Community's one-stop border posts demonstrate feasible alternatives.

Urban planning for cities like El Eulma must acknowledge existing parallel trade realities rather than ignoring them. The Doubaï market occupies residential areas, creating congestion and parking problems. Rather than periodic demolition threats, integrating commercial zones into urban plans with appropriate infrastructure would improve functionality while maintaining economic activity. Designated commercial zones with flexible regulations could attract informal businesses while addressing negative externalities.

### 7.4. Regional Economic Integration

Algeria's parallel trade networks connect to broader Maghreb and Mediterranean circuits extending to China and the Middle East. This suggests that purely national policy interventions will have limited impact if regional barriers persist. The Arab Maghreb Union (AMU), dormant since 1994, could potentially reduce formal trade costs to levels competitive with parallel networks if revived.

Intra-Maghreb trade currently represents less than 5% of total commerce, among the lowest regional integration levels globally. This reflects not just political tensions but substantial regulatory barriers that make formal regional trade expensive. Parallel networks exploit this gap, moving goods across borders through informal channels that bypass official procedures.

The African Continental Free Trade Area (AfCFTA), ratified by Algeria in 2020, provides a framework for regional integration if implementation proceeds effectively. However, success requires not just tariff elimination but addressing non-tariff barriers that currently drive parallel trade. Practical measures like coordinated border hours, authorized economic operator programs allowing expedited clearance, and regional payment systems would reduce transaction costs more effectively than tariff elimination alone.

Recent developments suggest growing recognition of integration's importance. The European Union, Algeria's primary trading partner with bilateral trade reaching €46.3 billion in 2023, has proposed sustainable investment initiatives targeting the Southern Neighbourhood. Leveraging these frameworks while pursuing deeper Maghreb integration could create synergies reducing parallel trade incentives.

Climate considerations add urgency to regional cooperation. Extreme climate events affect Algeria's economy and budget, with energy transition posing longer-term risks. Regional coordination on water resources, agricultural supply chains, and renewable energy could enhance resilience while creating formal trade opportunities that currently flow through informal channels.

## **8. Conclusion**

This study has examined how parallel economic networks reshape urban hierarchies and spatial organization in Algeria's Setif-El Eulma corridor. Using spatial econometric methods, network analysis, and qualitative evidence, we documented the emergence of El Eulma as a major commercial hub through informal trade networks despite its secondary status in formal urban hierarchies.

Our empirical findings support three main conclusions. First, parallel trade exhibits substantial spatial concentration, forming identifiable nodes despite operating outside formal planning frameworks. Agglomeration economies in information exchange, input sharing, and labor pooling drive this clustering. El Eulma's emergence reflects strategic positioning between coastal ports and interior markets, combined with social network density that provides alternative contract enforcement.

Second, infrastructure and institutional quality significantly influence informal economy size and spatial distribution, but in complex ways. Distance to ports increases informality by raising formal trade costs, while road quality reduces informality by facilitating formal commerce. These findings suggest that both infrastructure investment and institutional development affect spatial patterns, but neither alone determines outcomes.

Third, parallel networks establish alternative urban hierarchies that operate independently of formal systems while simultaneously depending on formal infrastructure. This dual structure challenges conventional urban hierarchy models

that assume economic centrality reflects population, infrastructure investment, or administrative status.

### 8.1. Summary of Key Findings

The informal economy in Algeria averages 33-45% of official GDP, with significant spatial variation driven by infrastructure access, institutional quality, and historical path dependencies. El Eulma has emerged as a primary node in parallel trade networks despite its secondary status in formal urban hierarchies, demonstrating that informal economic structures can establish autonomous spatial patterns independent of formal planning.

The spatial econometric analysis reveals strong positive spatial autocorrelation in both formal and informal economic activity (Moran's  $I = 0.42$  and  $0.24$  respectively). Infrastructure variables exhibit complex relationships with informality: distance to ports increases informal economy share by raising formal trade costs, while road quality reduces informality by facilitating formal commerce.

Network analysis documents El Eulma's central position in parallel trade circuits, with degree centrality of 28, betweenness centrality of 0.42, and eigenvector centrality of 0.89. Community detection identifies three functional clusters revealing hierarchical organization analogous to formal distribution systems but operating through trust-based rather than legal governance.

The difference-in-differences analysis shows dramatic impacts: night-time lights increased 127%, commercial property prices rose 255%, and employment expanded 60% relative to synthetic controls following the Doubaï market's consolidation. These magnitudes demonstrate that parallel trade networks can drive substantial urban economic development.

### 8.2. Theoretical Contributions

This study makes three principal theoretical contributions to urban and regional economics literature. First, we demonstrate that standard agglomeration mechanisms—information externalities, input sharing, and labor market pooling—operate powerfully in informal economies, generating spatial concentration despite absence of formal planning or zoning. This extends agglomeration theory beyond formal industrial districts to contexts where legal institutions provide limited support.

The trust-based governance systems we document in El Eulma's parallel trade networks substitute for formal contracts and legal enforcement through kinship ties, reputation mechanisms, and graduated sanctions. These alternatives prove sufficiently robust to support complex commercial transactions including extended credit arrangements and cross-border trade.

Second, we introduce the concept of parallel urban hierarchies—coexisting spatial organizations of formal and informal economic activity that may diverge substantially

in structure and logic. Standard urban hierarchy models implicitly assume a single hierarchy determined by population size, infrastructure investment, and administrative functions. Our findings demonstrate that informal networks can establish alternative hierarchies based on different determinants.

Third, our spatial econometric approach to informal economy measurement advances methodological frontiers by incorporating explicit spatial dependence and spillover effects into MIMIC models. Our commune-level estimation reveals substantial spatial heterogeneity and significant spillovers, indicating that informal activity in one location substantially affects neighbors through demonstration effects and network connections.

### 8.3. Policy Insights and Practical Implications

The policy implications emerging from this analysis challenge conventional formalization strategies emphasizing enforcement and administrative simplification. Our evidence suggests that informal economy size primarily reflects rational cost-benefit calculations given institutional constraints rather than ignorance of regulations or cultural preferences.

Alternative integration strategies focusing on transaction cost reduction offer greater promise. Streamlining customs procedures, simplifying tax compliance systems, modernizing labor regulations, and developing financial infrastructure could narrow cost differentials between formal and informal channels. These reforms make formal operation competitive by reducing its disadvantages rather than increasing informal activity's risks.

Spatial planning must acknowledge parallel network realities. Rather than periodic demolition threats that prove unenforceable, integrating commercial zones into urban plans with appropriate infrastructure would improve functionality while maintaining economic activity. This pragmatic approach accepts informality's persistence while managing its spatial impacts.

Regional integration offers longer-term potential. The African Continental Free Trade Area provides a framework for reducing barriers if implementation addresses non-tariff measures. Harmonized customs procedures, mutual recognition of standards, coordinated border operations, and regional payment systems would reduce formal trade costs potentially to levels competitive with informal channels.

### 8.4. Limitations and Future Research Directions

Several limitations circumscribe this study's scope. Geographic focus on Setif-El Eulma limits generalizability. Comparative analysis across Algerian regions or other Maghreb countries would test whether patterns represent general phenomena or location-specific outcomes. The MIMIC approach relies on indirect inference; complementary firm-level or household surveys would provide additional validation.

Network data limitations constrain our analysis. Merchant interviews provide valuable insight but cannot capture comprehensive network topology. Transaction data from financial institutions, customs records, or logistics companies could provide more complete network mapping. Mobile phone data or satellite imagery tracking commercial vehicle movements might reveal network structure through revealed behavior.

Dynamic aspects receive limited attention in our analysis. How do parallel networks evolve over longer time horizons? Do informal-formal transitions follow predictable patterns? Panel data spanning decades would illuminate dynamic processes. Historical analysis of how current patterns emerged would provide additional temporal depth.

The parallel urban hierarchy concept requires further theoretical formalization. Under what conditions do formal and informal hierarchies converge versus diverge? Theoretical models incorporating dual hierarchies with explicit microfoundations would clarify mechanisms and generate testable predictions.

Welfare analysis remains underdeveloped. While we document substantial employment and income generation, distributional consequences require attention. Who benefits from informal networks and who bears costs? Dynamic welfare effects through institutional development merit investigation. Comprehensive welfare accounting would inform normative evaluations beyond efficiency considerations.

### 8.5. Concluding Reflections

The transformation of El Eulma exemplifies broader development dynamics in resource-dependent economies with weak institutional capacity. Far from representing marginal survival activities, parallel networks demonstrate sophisticated organization and fundamentally reshape urban spatial structure. The "Dubai markets" constitute a distinct form of economic globalization operating largely outside formal institutions yet thoroughly integrated into global production and distribution systems.

This reality poses fundamental challenges for development policy and urban planning. Conventional frameworks assuming formal institutions shape economic geography prove inadequate when parallel networks account for 30-50% of economic activity. Neither ignoring informal networks nor attempting elimination through enforcement proves viable.

A more productive approach acknowledges parallel networks as enduring features that will persist until fundamental cost differentials narrow substantially. Policy should focus on reducing those differentials rather than increasing informal activity's costs through enforcement. Spatial planning should accommodate informal networks' spatial logics while managing externalities. Regional integration reducing formal trade barriers could redirect informal flows as costs converge.

For researchers, the Algeria case demonstrates the value of integrating spatial analysis, institutional economics, and network perspectives. Spatial econometric methods, network analysis, and qualitative investigation provide complementary insights that advance understanding beyond aggregate estimation alone.

The concept of parallel urban hierarchies offers a framework for understanding seemingly anomalous development patterns in many developing economies. When parallel networks account for substantial economic activity shares, their spatial logic influences overall patterns significantly. This represents a fundamental reconceptualization of how we think about urban systems in developing economies.

As Algeria and similar economies navigate development transitions, the interplay between formal institutions and parallel networks will continue shaping spatial organization and economic outcomes. Understanding these dynamics remains essential for both academic research and practical policymaking. The Setif-El Eulma corridor provides a window into these processes, revealing both challenges and possibilities in contexts where formal and informal economies coexist, compete, and occasionally complement each other.

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